restricted instrument set. The lower bound estimate from the AT&T price reverse regression is 8.5% (18.3% - 9.8%).

The potential deadweight loss from supra-competitive pricing can be calculated as the area bordered by the demand curve, marginal cost curve and the current output (figure 2). The economic profits, output times the difference between price and long-run marginal cost, could also be considered losses to society if that amount is expended to perpetuate the entry barrier creating the rents (Posner (1975)). This is likely not the case here since regulators are taking significant steps to introduce competition to the long distance market. Given this regulatory predilection, the return to this sort of rent seeking by AT&T should be quite low. If so, the dead weight loss can be calculated simply as $DWL = \int_{MC}^{P_o} [Q(p) - Q(P_o)]\, dp$, assuming constant marginal costs. With constant elasticity, the inverse demand is given by $Q(p) = Q_o(p/P_o)^{\eta}$. The resulting deadweight loss as a fraction of current revenue is $DWL/REV = [1-(1-L)^{1+\eta}]/(1+\eta) - L$ where L is the Lerner index.

While firm-specific elasticities are appropriate for generating estimates of the Lerner index, the industry elasticity is the relevant elasticity for calculating the deadweight loss. If the OCCs were able to match the hypothetically lower AT&T prices set at long-run marginal cost, then the deadweight loss applies to the whole industry. This would be the case if AT&T were providing a price umbrella over an industry in which all firms had similar nondecreasing cost functions. If instead, AT&T can operate at lower long-run marginal cost than the OCCs, then it would capture the entire market with prices at long-run marginal cost. In this case the firm demand elasticity is the industry demand elasticity. Table 5 reports the ratio of potential deadweight loss to revenue for various price-marginal cost margins assuming a demand elasticity of -0.65.

The relevant deadweight loss from table 5 depends on which values of long-run marginal cost are used. Reducing the largest estimate of AT&T's short-run price-cost margin (0.337) by the size of the bias derived from the OCC Lerner index (0.151) yields a long-run Lerner index of 0.186 and a

deadweight loss of about 1.26% of total revenues. Reducing the smallest estimate of AT&T's short-run price-cost margin (0.183) by the measure of the bias derived from the OCC Lerner index (0.098) yields a long-run Lerner index of 0.085 and a deadweight loss of about 0.25% of total revenues. These estimates compare favorably with the range of the current economy-wide estimates of deadweight loss due to market power of 0.5% to 2.0% of GNP (Scherer and Ross (1990), pp. 663-667).

If this market is currently more competitive than during the 1988-1991 period, then these estimates will overstate the current potential deadweight loss due to supra-competitive pricing. The evidence of a more competitive market is: 1) the fall in AT&T's market share from a national average of 67% during the sample period to 60% currently, 2) the introduction of 800 number portability, and 3) the increase in the number of foreign countries reached by OCC networks.

An alternative representation of the Lerner index is $L^{ATT} = S^{ATT} / [\,|\eta^{LD}| + \theta^{OCC}(1-S^{ATT})]$ where S^{ATT} is AT&T's market share and θ^{OCC} is the OCC supply elasticity (Landes and Posner (1981)). With values of L^{ATT}, S^{ATT} and η^{LD} of 0.186, 0.67 and -0.65 respectively, θ^{OCC} becomes 8.95. This implies that the OCCs would be willing to increase their output by almost 90% at prices 10% higher than current prices. Assuming an OCC supply elasticity of 8.95, the reduction in AT&T's market share from 67% to 60% alone would reduce the Lerner index from 0.186 to 0.142 and the potential deadweight loss from 1.26% to 0.71% of revenue. Portability of 800 numbers and increased international access by the OCCs will tend to increase θ^{OCC} as the OCCs are better able to provide substitutes for AT&T's services. If, in addition to the fall in AT&T's market share, the OCC supply elasticity has increased from 8.95 to 10.0, AT&T's Lerner index would decrease from 0.142 to 0.129 and the potential deadweight loss would decrease from 0.71% to 0.58% of revenue.

To be sure, even the upper-bound estimate of the potential deadweight loss from supra-competitive pricing, 1.26% of long distance industry revenue, represents $696 million in 1991, no small sum. The 0.25% estimate using the largest elasticities represents $138 million per year. However, a

sense of the magnitude of the deadweight loss can be discerned from the comparison between the benefits and costs of price regulation. Under perfect price regulation (an admittedly unattainable goal), AT&T's prices would be equal to marginal costs and the elimination of the entire deadweight loss would be the benefit. Imperfect regulation that allowed AT&T to set prices midway between marginal cost and the profit maximizing price level would eliminate about three-quarters of the potential deadweight loss.[16]

The welfare costs due to price regulation of AT&T can only be gauged in reference to studies of past deregulatory actions. Mathios and Rogers (1989, 1990) and Kaestner and Kahn (1990) found that AT&T prices were 7% lower in states that use price-cap incentive regulation compared to traditional rate-of-return regulation. This effect presumably occurred, at least in part, because the less restrictive regulatory structure induced cost reductions. Supply estimates reported above provide some evidence that the movement to price-caps from rate-of-return regulation reduced AT&T's long distance prices by approximately 1.6%. Olley and Pakes (1992) find that competition spurs telecommunications manufacturing plants to become more efficient. Ying and Shin (1993) found that the local telephone companies' costs fell due to the divestiture of AT&T. Crandall (1991) estimates that telephone industry costs would be $3.5 billion (10%) higher in 1988 than they would have been without the introduction of competition in telecommunications. Kwoka (1993) estimates that each percentage point decrease in AT&T's market share has led to a more than one-third percent (0.36%) improvement in productivity. Since these productivity increases provide continuing benefits into the future, seemingly small improvements quickly become substantial cost savings.

[16]The resulting upper-bound estimate of the benefit from regulation would be 0.96% of industry revenues or $530 million per year (the lower-bound estimate would be 0.20% of industry revenues or $104 million per year).

VII. Conclusion

This paper estimates supply and demand relationships in the long distance telecommunications market over the 1988 to 1991 period and interprets them in terms of potential welfare losses due to supra-competitive pricing. The estimates of industry demand elasticity are similar to those reported elsewhere. The prices of key inputs explain much of the variation in output prices and these are taken to be valid instruments for demand estimation. Estimates of firm specific demand elasticities are fairly high; lower bounds are -2.9 for AT&T and -6.6 for the OCCs. These elasticities are best interpreted as short-run elasticities. Long-run price-cost margins are inferred from these estimates via the Lerner index from which the potential deadweight loss due to supra-competitive pricing is calculated. Estimates of this potential loss appear to vary between 0.25% and 1.26% of industry revenue ($138 million to $696 million per year).

The above analysis brings new information to the question of whether further deregulation of AT&T is likely to be efficient. As stated in the introduction, the benefits of regulation are the possible limiting of the deadweight loss due to supra-competitive pricing while the costs are inefficient production due to regulatory distortion of profit incentives. In the early 1980s, competition may have been insufficient to constrain AT&T prices to long-run marginal cost. In the intervening decade, competitive pressures on AT&T increased substantially. This paper estimates that, for the 1988 to 1991 period, competition constrained the potential deadweight loss from supra-competitive prices to between 0.25% and 1.26% of total revenues. Competitive pressures have continued to mount and it is likely that the potential deadweight loss currently is smaller.

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Figure 1
AT&T's Basket 1 Price Cap & Price Index
(Nominal Prices)

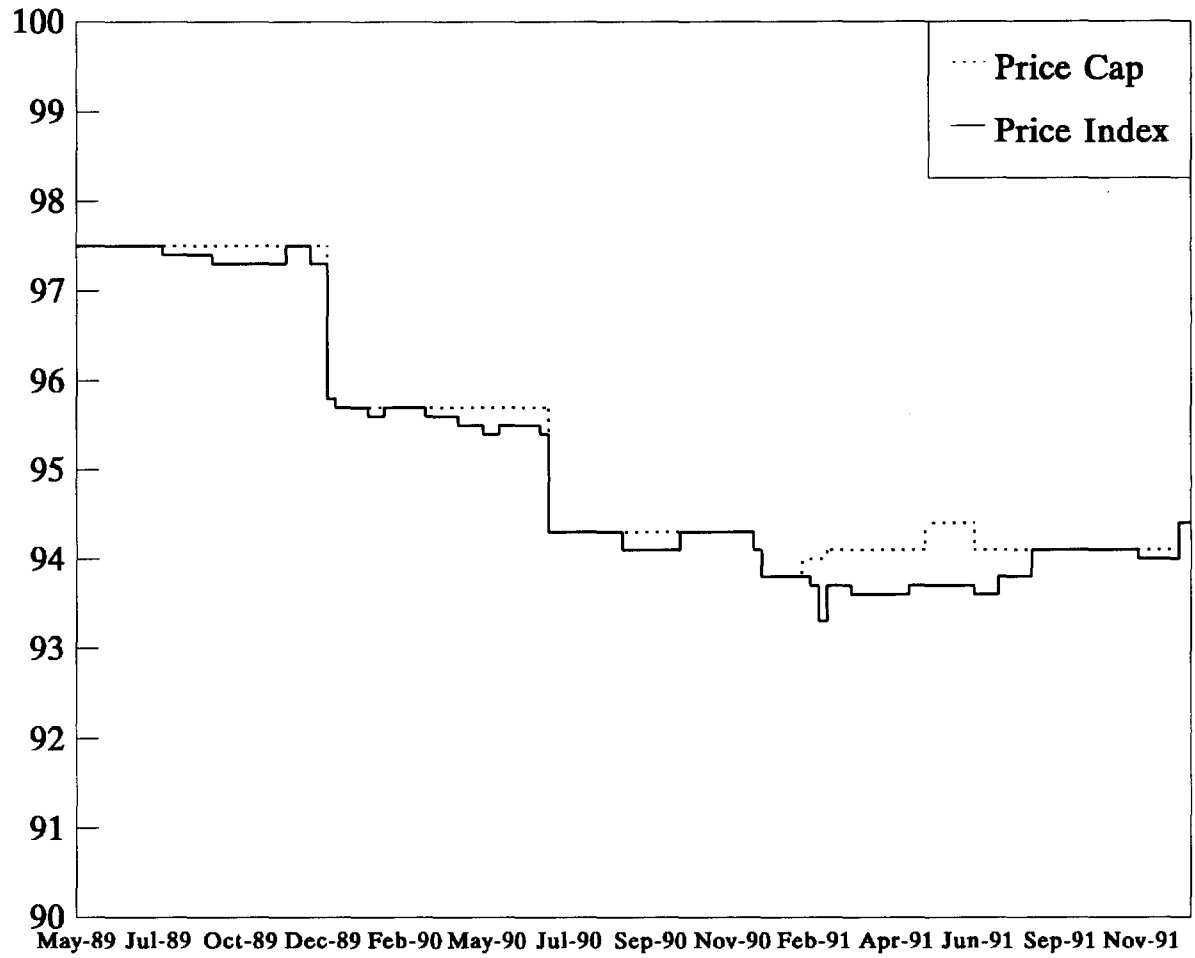

Figure 2
Deadweight Loss from Supra-competitive Pricing

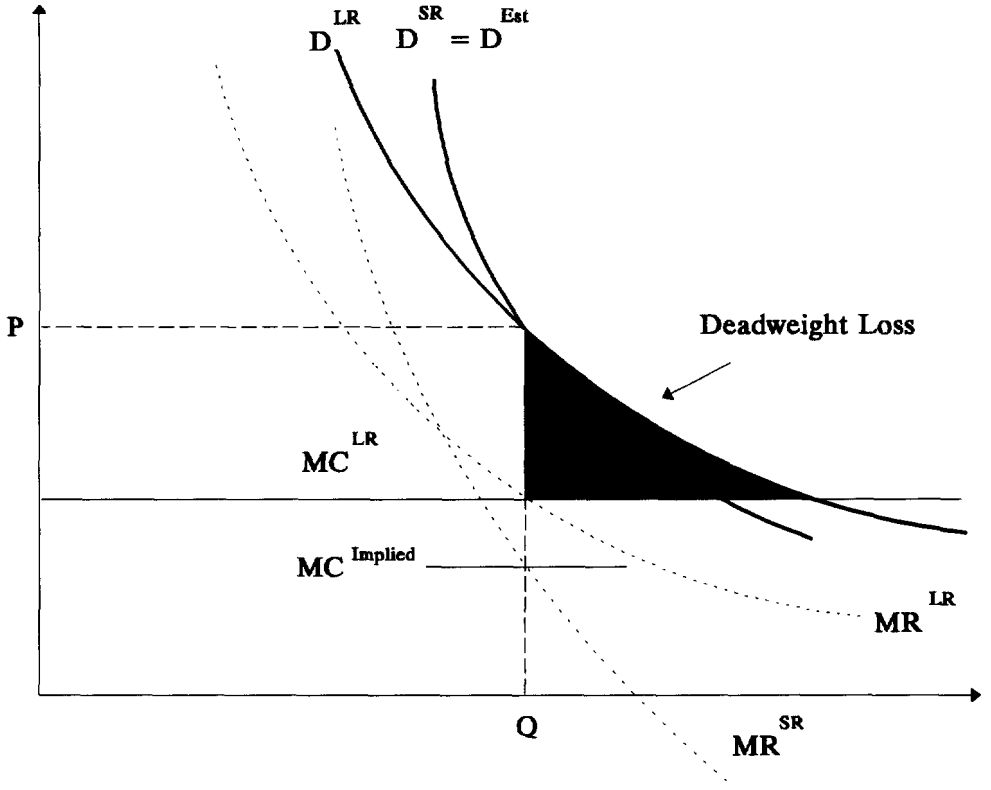

Figure 3
Long Distance Price Variables
(Real Prices)

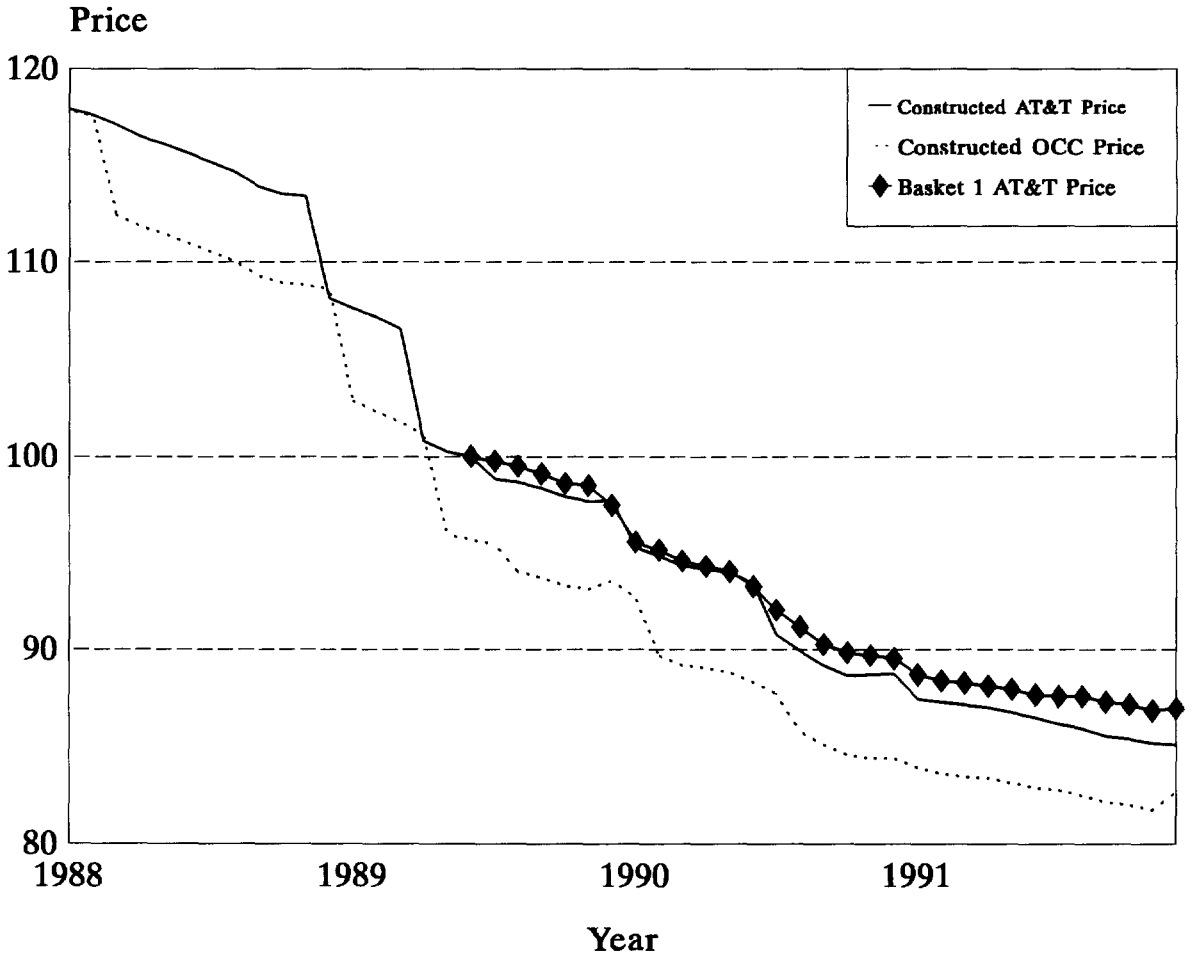

Figure 4
Long Distance Discounts
(Real Prices)

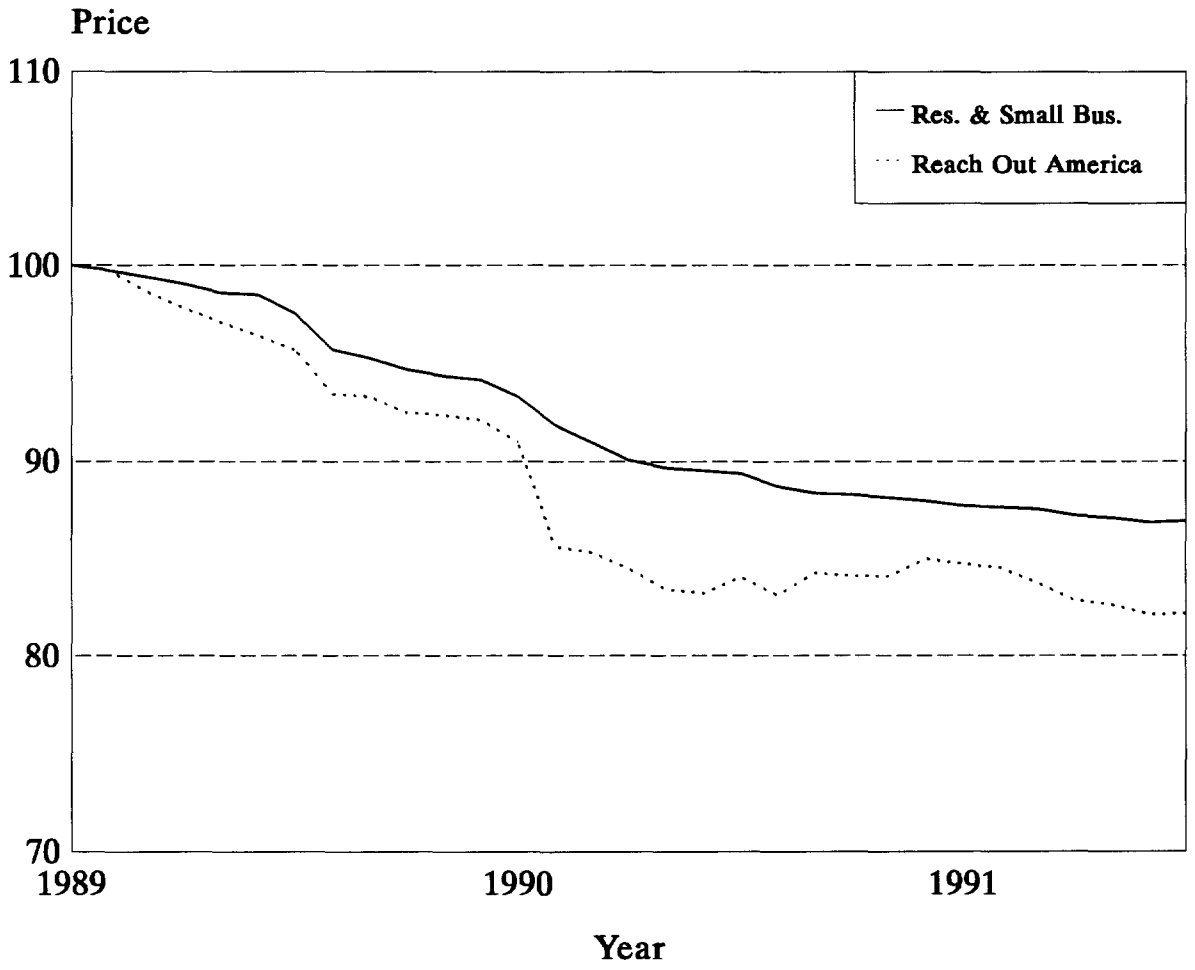

Table 1
Supply Price Equations
2SLS Estimates - 240 Observations
January 1988 - December 1991

Variable	AT&T Price	OCC Price
Price Cap	-0.016[1]	-0.007
	(0.006)	(0.007)
Minutes of Use	-0.048	-0.040
	(0.039)	(0.037)
Price of Switching Equipment	0.189[3]	0.117
	(0.087)	(0.093)
Price of Transmission Equipment	0.368[1]	0.717[1]
	(0.112)	(0.094)
Telecommunications Workers Wage	0.301[5]	0.054
	(0.151)	(0.129)
Yield to Maturity on Corporate Bonds	0.048	0.503[5]
	(0.404)	(0.256)
Price of Switched Access	0.131[1]	0.194[1]
	(0.022)	(0.021)
Price of Special Access	0.081[1]	0.049[1]
	(0.020)	(0.008)
First-Order Autocorrelation	0.789[1]	0.762[1]
	(0.040)	(0.042)
Adjusted R^2	.970	.977

Standard errors are in parentheses and superscripts denote significance levels for a two-tailed test if less than 10%. Not reported are coefficients of state dummy variables.

Table 2
Industry Quantity Demanded
2SLS Estimates - 63 Observations
June 1986 - August 1991

Variable	National Quantity	National Quantity	National Quantity	National Quantity
Constant	-1.127	-11.781[3]	-2.256	-4.737
	(4.387)	(5.533)	(4.071)	(4.652)
Long Distance Price	-0.899[1]	-0.569[1]	-0.622[1]	-0.603[1]
	(0.085)	(0.137)	(0.133)	(0.127)
Local Service Price	-0.849[1]	-1.024[1]	-0.221	-0.373
	(0.242)	(0.247)	(0.281)	(0.323)
Telephone Set Price		-0.946[1]		-0.295
		(0.293)		(0.302)
Income	1.703[1]	2.661[1]	1.499[1]	1.797[1]
	(0.272)	(0.409)	(0.243)	(0.383)
Time Trend			0.042[1]	0.032[7]
			(0.014)	(0.018)
Durbin-Watson	2.092	2.273	2.367	2.398
Adjusted R^2	.984	.985	.987	.986

Standard errors are in parentheses and superscripts denote significance levels for a two-tailed test if less than 10%. Not reported are coefficients of month dummy variables.

Table 3
Lower Level Demand Equations
2SLS Estimates - 240 Observations
January 1988 - December 1991

AT&T Demand	All Instruments			Instruments Exclude Carrier Access Prices		
Variable	**Market Share Regression**	**AT&T Price Regression**	**OCC Price Regression**	**Market Share Regression**	**AT&T Price Regression**	**OCC Price Regression**
Own-Price	-1.16[1] (0.31)	-5.87*	-4.23*	-2.15[1] (0.49)	-4.68*	-3.78*
Cross-Price	1.44[1] (0.31)	6.09*	5.16*	2.42[1] (0.49)	4.91*	4.61*
Auto-correlation	0.39[1] (0.06)	0.25[1] (0.06)	0.25[1] (0.06)	0.31[1] (0.06)	0.25[1] (0.06)	0.26[1] (0.06)
Adjusted R^2	.774	.987	.988	.644	.986	.988
OCC Demand	**All Instruments**			**Instruments Exclude Carrier Access Prices**		
Variable	**Market Share Regression**	**AT&T Price Regression**	**OCC Price Regression**	**Market Share Regression**	**AT&T Price Regression**	**OCC Price Regression**
Cross-Price	2.47[1] (0.72)	13.47*	7.97*	5.14[1] (1.19)	8.73*	6.99*
Own-Price	-3.09[1] (0.71)	-13.95*	-11.72*	-5.73[1] (1.18)	-9.27*	-8.87*
Auto-correlation	0.61[1] (0.05)	0.31[1] (0.06)	0.33[1] (0.06)	0.48[1] (0.06)	0.36[1] (0.06)	0.37[1] (0.06)
Adjusted R^2	.550	.987	.988	.227	.988	.986

Standard errors are in parentheses and superscripts denote significance levels for a two-tailed test if less than 10%. Estimates with asterisks are the implied elasticities from the coefficients of reverse regressions. The underlying coefficients are always significant at the one percent level. Not reported are coefficients of state and month dummy variables.

Table 4
Unconditional Own-Price Elasticities and Lerner Indices

	Elasticities		Lerner Indices	
	AT&T	OCC	AT&T	OCC
All Instrumental Variables				
Market Share Regression	-1.97	-4.00	0.508	0.250
AT&T Price Regression	-6.65	-14.86	0.150	0.067
OCC Price Regression	-5.00	-12.63	0.200	0.079
Restricted Instrument Set				
Market Share Regression	-2.92	-6.64	0.337	0.151
AT&T Price Regression	-5.45	-10.16	0.183	0.098
OCC Price Regression	-4.55	-9.78	0.220	0.102

Table 5
Potential Deadweight Loss as a Percent of Current Revenues under Various Price Markup Assumptions Assuming a -0.65 Industry Demand Elasticity

$\frac{P_0 - MC}{P_0}$	$\frac{DWL}{REV}$
0.350	4.99%
0.325	4.22%
0.300	3.53%
0.275	2.91%
0.250	2.37%
0.225	1.89%
0.200	1.47%
0.175	1.10%
0.150	0.80%
0.125	0.55%
0.100	0.34%
0.075	0.19%
0.050	0.08%
0.025	0.02%